

WHAT IS CLAIMED IS:

1. A method for coating a flexible substrate which comprises rotationally casting to the substrate a coating comprising a polyurethane composition formed from (a) a substantially linear isocyanate-terminated polyurethane prepolymer; and, (b) a curative agent containing a diol having a molecular weight of less than about 250 and, optionally, a secondary aliphatic diamine, wherein the polyurethane composition is formed in the absence of a non-linear isocyanate-terminated polyurethane prepolymer.

2. The method of Claim 1 wherein the flexible substrate is a fabric, a foam or a thin metal sheet.

3. The method of Claim 2 wherein the fabric is selected from the group consisting of nylon, rayon, polyester, cotton, wool, kevlar and fiberglass.

4. The method of Claim 2 wherein the foam is selected from the group consisting of polyurethane, polyethylene, vinyl polymer, rubber latex, nitrile and neoprene.

5. The method of Claim 1 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is a reaction product of a polyol and an organic diisocyanate monomer selected from the group consisting of 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 4,4'-diisocyanatodiphenylmethane (MDI), p-phenylenediisocyanate (PPDI), diphenyl-4,4'-diisocyanate, 1,3-xylene diisocyanate, 1,4-xylene diisocyanate, 1,6-hexamethylene diisocyanate, 1,3-cyclohexyl diisocyanate, 1,4-cyclohexyl diisocyanate (CHDI), diphenylmethane diisocyanate (H(12)MDI) and isophorone diisocyanate.

6. The method of Claim 5 wherein the organic diisocyanate monomer is selected from the group consisting of MDI and PPDI.

7. The method of Claim 1 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is a reaction product of an organic diisocyanate monomer and a polyol selected from the group consisting of ethylene glycol, diethylene glycol, tetramethylene ether glycol, 1,2-propylene glycol, 1,3-propane diol, 1,4-butylene glycol, polytetramethylene ether glycol (PTMEG), polycarbonate and a dihydroxy polyester.

8. The method of Claim 1 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is a reaction product of an organic diisocyanate monomer and a dihydroxypolyester.

9. The method of Claim 1 wherein the diol is selected from the group consisting of ethylene glycol, 1,2-propylene glycol, 1,3-propanediol, 1,3-butylene glycol, 1,4-butanediol, 2-methyl-1,3-propanediol, 1,5-pentanediol, neopentyl glycol, 1,6-hexanediol, 2-ethyl-2-propyl-1,3-propanediol, cyclohexyldimethanol, cyclohexanediol, hydroquinone di (betahydroxyethyl)ether, and resorcinor di(betahydroxy)ethyl ether.

10. The method of Claim 1 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is prepared by reacting an organic diisocyanate monomer with a polyol, in a mole ratio of organic diisocyanate monomer to polyol ranging from about 1.7:1 to about 12:1.

11. The method of Claim 1 wherein the diol is mixed with the secondary aliphatic diamine in an amount ranging from about 95 to 100 weight percent based on the total weight of the diol and diamine.

12. The method of Claim 1 further containing the secondary aliphatic diamine.

13. The method of Claim 12 wherein the secondary aliphatic diamine is selected from the group consisting of dimethylethylenediamine and piperazine.

14. The method of Claim 12 wherein the secondary aliphatic diamine is mixed with the diol in an amount ranging from about 0.25 to about 1 weight percent based on the total weight of the diamine and diol.

15. The method of Claim 12 wherein the total active hydrogen content of the diol and secondary aliphatic diamine is equal to about 80-115% of the total isocyanate content of the isocyanate-terminated polyurethane prepolymer.

16. The method of Claim 12 wherein the total active hydrogen content of the diol and secondary aliphatic diamine is equal to about 90-95% of the total isocyanate content of the isocyanate-terminated polyurethane prepolymer.

17. A flexible substrate possessing a coating, the coating comprising a polyurethane composition formed from (a) a substantially linear isocyanate-terminated polyurethane prepolymer; and, (b) a curative agent containing a diol having a molecular weight of less than about 250 and, optionally, a secondary aliphatic diamine, wherein the polyurethane composition is formed in the absence of a non-linear isocyanate-terminated polyurethane prepolymer.

18. The flexible substrate of Claim 17 wherein the flexible substrate is a fabric, a foam or a thin metal sheet.

19. The flexible substrate of Claim 18 wherein the fabric is selected from the group consisting of nylon, rayon, polyester, cotton, wool, kevlar and fiberglass.

20. The flexible substrate of Claim 18 wherein the foam is selected from the group consisting of polyurethane, polyethylene, vinyl polymer, rubber latex, nitrile and neoprene.

5                   21. The flexible substrate of Claim 17 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is a reaction product of a polyol and an organic diisocyanate monomer selected from the group consisting of 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 4,4'-diisocyanatodiphenylmethane (MDI), p-phenylenediisocyanate (PPDI), diphenyl-4,4'-diisocyanate, 1,3-xylene diisocyanate, 1,4-  
10 xylene diisocyanate, 1,6-hexamethylene diisocyanate, 1,3-cyclohexyl diisocyanate, 1,4-cyclohexyl diisocyanate (CHDI), diphenylmethane diisocyanate (H(12)MDI) and isophorone diisocyanate.

15                   22. The flexible substrate of Claim 21 wherein the organic diisocyanate monomer is selected from the group consisting of MDI and PPDI.

20                   23. The flexible substrate of Claim 17 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is a reaction product of an organic diisocyanate monomer and a polyol selected from the group consisting of ethylene glycol, diethylene glycol, tetramethylene ether glycol, 1,2-propylene glycol, 1,3-propane diol, 1,4-butylene glycol, polytetramethylene ether glycol (PTMEG), polycarbonate and a dihydroxypolyester.

25                   24. The flexible substrate of Claim 23 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is a reaction product of an organic diisocyanate monomer and a dihydroxypolyester.

25. The flexible substrate of Claim 17 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is prepared by reacting an organic diisocyanate monomer with a polyol, in a mole ratio of organic diisocyanate monomer to polyol ranging from about 1.7:1 to about 12:1.

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26. The flexible substrate of Claim 17 wherein the diol is selected from the group consisting of ethylene glycol, 1,2-propylene glycol, 1,3-propanediol, 1,3-butylene glycol, 1,4-butanediol, 2-methyl-1,3-propanediol, 1,5-pentanediol, neopentyl glycol, 1,6-hexanediol, 2-ethyl-2-propyl-1,3-propanediol, cyclohexyldimethanol, cyclohexanediol, hydroquinone di(betahydroxyethyl)ether, and resorcinol di(betahydroxy)ethyl ether.

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27. The flexible substrate of Claim 17 wherein the diol is mixed with the secondary aliphatic diamine in an amount ranging from about 95 to 100 weight percent based on the total weight of diol and diamine.

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28. The flexible substrate of Claim 17 further containing the secondary aliphatic diamine.

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29. The flexible substrate of Claim 28 wherein the secondary aliphatic diamine is selected from the group consisting of dimethylethylenediamine and piperazine.

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30. The flexible substrate of Claim 28 wherein the secondary aliphatic diamine is mixed with the diol in an amount ranging from about 0.25 to about 1 weight percent based on the total weight of diamine and diol.

31. The flexible substrate of Claim 28 wherein the total active hydrogen content of the diol and secondary aliphatic diamine is equal to about 80-115% of the total isocyanate content of the isocyanate-terminated polyurethane prepolymer.

5 32. The flexible substrate of Claim 28 wherein the total active hydrogen content of the diol and secondary aliphatic diamine is equal to about 90-95% of the total isocyanate content of the isocyanate-terminated polyurethane prepolymer.

10 33. A flexible substrate possessing a coating, the coating exhibiting a flex fatigue resistance of from about 25,000 to about 2,000,000, the coating consisting essentially of a polyurethane composition formed from (a) a substantially linear isocyanate-terminated polyurethane prepolymer; and, (b) a curative agent containing a diol having a molecular weight of less than about 250, and, optionally, a secondary aliphatic diamine.

15 34. The flexible substrate of Claim 33 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is a reaction product of a polyol selected from the group consisting of ethylene glycol, diethylene glycol, tetramethylene ether glycol, 1,2-propylene glycol, 1,3-propane diol, 1,4-butylene glycol, polytetramethylene ether glycol (PTMEG), polycarbonate and a dihydroxypolyester and an organic  
20 diisocyanate monomer selected from the group consisting of 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 4,4'-diisocyanatodiphenylmethane (MDI), p-phenylenediisocyanate (PPDI), diphenyl-4,4'-diisocyanate, 1,3-xylene diisocyanate, 1,4-xylene diisocyanate, 1,6-hexamethylene diisocyanate, 1,3-cyclohexyl diisocyanate, 1,4-cyclohexyl diisocyanate (CHDI), diphenylmethane diisocyanate (H(12)MDI) and  
25 isophorone diisocyanate.

35. The flexible substrate of Claim 33 wherein the substantially linear isocyanate-terminated polyurethane prepolymer is prepared by reacting an organic

diisocyanate monomer with a polyol, in a mole ratio of organic diisocyanate monomer to polyol ranging from about 1.7:1 to about 12:1.

5                    36. The flexible substrate of Claim 33 wherein the diol is selected from the group consisting of ethylene glycol, 1,2-propylene glycol, 1,3-propanediol, 1,3-butylene glycol, 1,4-butanediol, 2-methyl-1,3-propanediol, 1,5-pentanediol, neopentyl glycol, 1,6-hexanediol, 2-ethyl-2-propyl-1,3-propanediol, cyclohexyldimethanol, cyclohexanediol, hydroquinone di (betahydroxyethyl)ether, resorcinol  
10                    di(betahydroxy)ethyl ether.

                    37. The flexible substrate of Claim 33 wherein the diol is mixed with the secondary aliphatic diamine in an amount ranging from about 95 to 100 weight percent based on the total weight of diol and diamine.

15                    38. The flexible substrate of Claim 33 further containing the secondary aliphatic diamine.

                    39. The flexible substrate of Claim 38 wherein the secondary aliphatic diamine is selected from the group consisting of dimethylethylenediamine and  
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                    40. The flexible substrate of Claim 38 wherein the secondary aliphatic diamine is mixed with the diol in an amount ranging from about 0.25 to about 1 weight percent based on the total weight of diamine and diol.  
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